Membrane influence on electrodialytic remediation of air pollution control from municipal incinerated solid waste

Parés Viader, Raimon; Jensen, Pernille Erland; Ottosen, Lisbeth M.

Published in:
Proceedings of the 13th Symposium on Electrokinetic Remediation

Publication date:
2014

Document Version
Publisher's PDF, also known as Version of record

N° REF.: P129

Membrane influence on electrodialytic remediation of air pollution control from municipal incinerated solid waste

Raimon Parés Viader[a*], Pernille Erland Jensen[a], Lisbeth M. Ottosen[a]

[a] *Department of Civil Engineering, Technical University of Denmark, 2800 Kongens Lyngby, Denmark*
**Corresponding author: rapv@byg.dtu.dk*

Electrodialysis (ED) has been widely investigated as a technology to reduce the leaching of metals and salts in some polluted materials, such as Municipal Solid Waste Incineration (MSWI) Air Pollution Control (APC) [1]. Important parameters of ED like the intensity, the remediation time or the membrane brand used have been studied on different materials [2, 3]. However, no previous research has been done on the impact of the membranes used when treating APC residues. This is a crucial criterion when scaling up, because the costs of the membranes change dramatically from one brand to another.

In the present work, four different brand membranes were used in the same electrodialytic cell set up (Figure 1) and at the same operating conditions, treating two different kinds of MSWI APC; one of a dry flue-gas cleaning system and another of a wet flue-gas cleaning system.

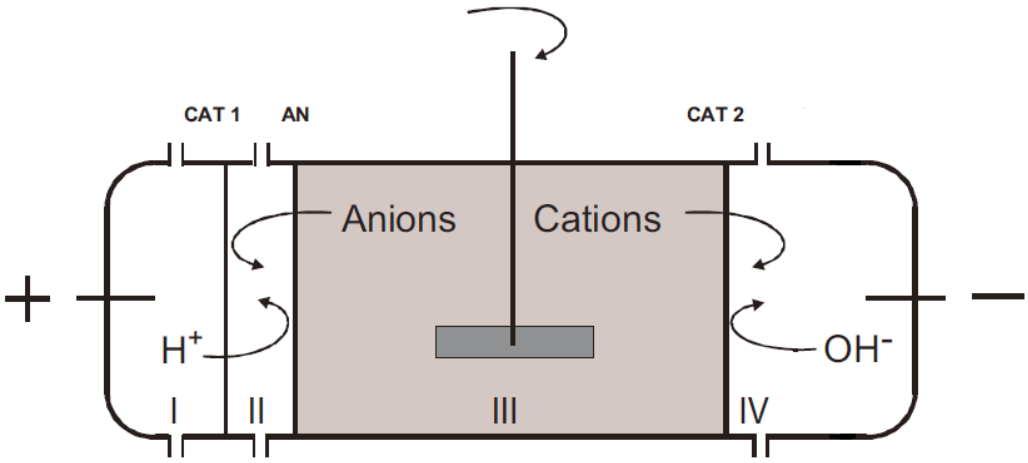

Figure 1. Schematic view of a cell used for the ED treatment of both APC residues. AN: anion-exchange membrane; CAT1 /CAT2: cation-exchange membranes.

The targeted metals were Al, As, Ba, Ca, Cd, Cr, Cu, Mn, Mo, Na, Ni, Pb, V, Zn, whereas the targeted salts were chloride and sulfate. The results show that the leaching of metals and salt from the APC residues was generally reduced for all membranes after ED remediation. However, with a confidence limit of a 95%, the leaching of the following elements was found to be different after ED treatment depending on the membrane used:

- For the APC residue from the dry flue-gas cleaning system: Ca, Cr, Cu, Na, Ni, Pb, Zn, Cl, SO_4.

- For the APC residue from the wet flue-gas cleaning system: Al, Ba, Cr, Cu, Mn, Mo, Na, Ni, V, Zn, Cl, SO_4.

For some elements and membranes, the final leaching values were below the Danish law thresholds in the reuse of waste materials in the construction industry.

References

[1] G.M. Kirkelund, P.E. Jensen, A. Villumsen, L.M. Ottosen, J. Appl. Electrochem. 40 (2010): 1049-1060

[2] P. E. Jensen, L. M. Ottosen, C. Ferreira, Electrochimica Acta, 52 (2007), 3412-3419

[3] L.-G. Ulises, A.-L. René, O. German, T.-G. Julieta, C. Federico, Journal of Water Resource and Protection, 3 (2011), 387-397